(12) UK Patent Application (19) GB (11) 2 352 706 (13) A

(43) Date of A Publication 07.02.2001

(21) Application No 9918307.1

(22) Date of Filing 03.08.1999

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(51) INT CL^7
B65D 81/34 , A23L 1/182

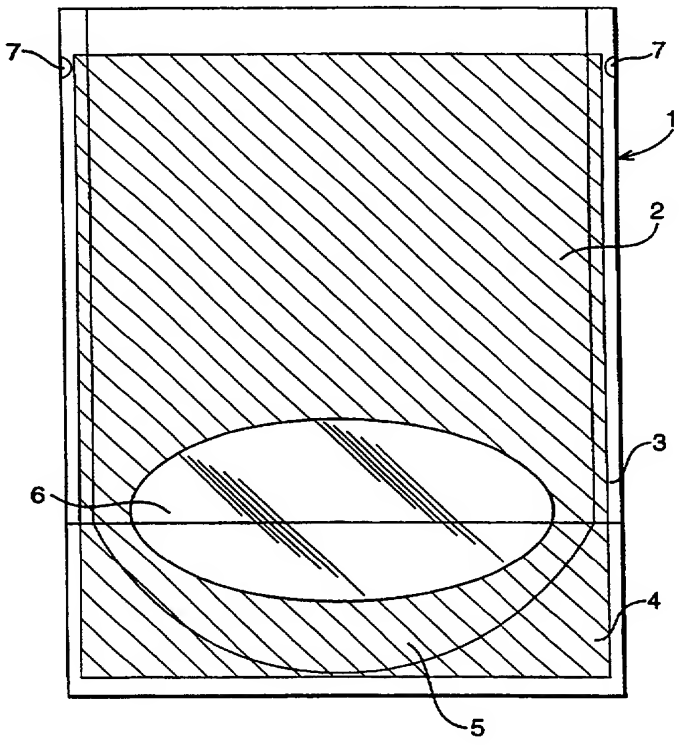
(52) UK CL (Edition S)
B8C CWA1
A2B BKC B362

(56) Documents Cited
EP 0728678 A2 **JP 110094260 A** **JP 110028063 A**
JP 100167344 A

(58) Field of Search
UK CL (Edition Q) **A2B BMR1 BMR5 , B8C CWA1**
INT CL^6 **A23L 1/182 , B65D 81/34**
ONLINE:EPODOC, WPI, JAPIO

(54) Abstract Title
Shelf stable precooked cereal product in pouch

(57) The invention provides a microwaveable pouch 1 containing a shelf stable precooked cereal product. Preferably, the pouch consists essentially of gas- and microorganism-impermeable polymeric sheet material and the precooked cereal product comprises at least 40% by weight of water. The cereal product is heat sterilised to render it shelf stable at ambient temperature for at least a month, but the product can be microwaved in the pouch to result in a free flowing, particulate hot cereal product. Preferably, the cereal is rice. Front and back panels of the pouch are heat sealed together around edge 3, with a curved seal 4 giving a rounded bottom 5 to its interior. The pouch is coloured and printed except for a window 6, and can be torn or cut open at nips 7.



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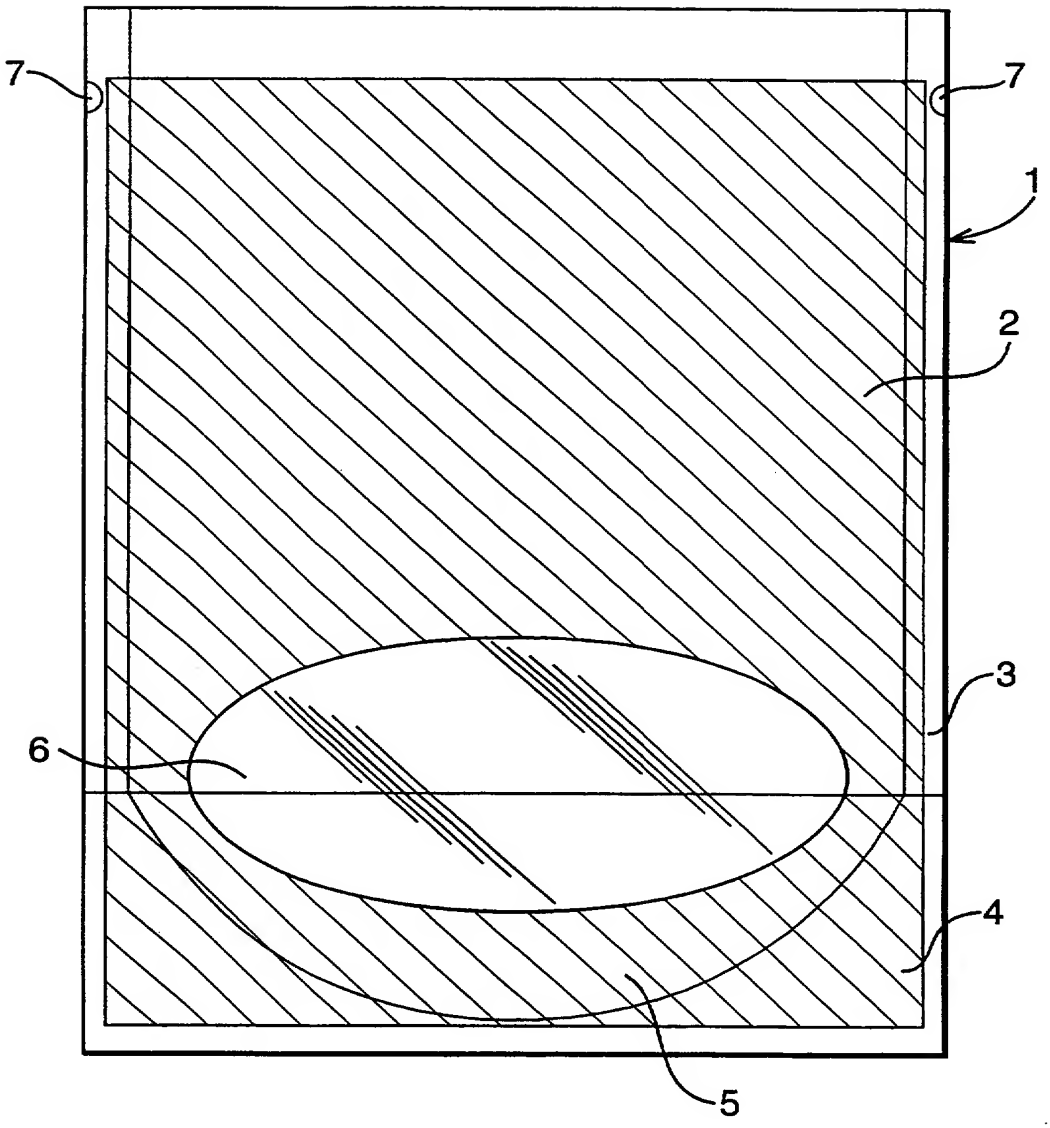
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SHELF STABLE PRECOOKED CEREAL PRODUCTS

The present invention relates to precooked cereal products, and in particular to a shelf stable microwaveable pouch containing precooked cereal.

It is known to provide precooked rice products in the form of canned precooked rice. The canned precooked rice is prepared by inserting raw or parboiled rice into the can together with a predetermined amount of water and optional flavouring ingredients, sealing the can, and retorting the can at temperatures sufficiently high and for a sufficient time to achieve shelf stability. The rice is preferably cooked inside the can concurrently with the sterilisation step.

The resulting precooked, canned rice is shelf stable. That is to say, it is stable on storage at a temperature of 25°C for at least one month, preferably at least 3 months, 12 months or longer. Unfortunately, the canned precooked rice tends to form a solid agglomerated mass over time rather than a free flowing particulate edible rice. This agglomeration is thought to result from retrogradation of the cooked starch granules over time. Retrogradation involves the gradual crystallisation of the starch granules so that they extrude water. When this occurs with cooked rice the texture of the rice becomes chalky, and the water displaced from the rice dissolves any free starch on the surface of the grains to produce a starch glue which sticks the rice grains together.

As a result of this agglomeration the rice is somewhat unappetising when the can is opened. The effect of retrogradation can be reversed to some extent by reheating the rice for a period of time sufficient to achieve separation of the grains. However, it has hitherto been difficult to produce a fully satisfactory free flowing rice product by reheating canned rice.

DE-A-1492657 addresses the problem of agglomeration of precooked canned rice by freezing the canned rice after sterilisation to –12 °C and then thawing it. The additional process steps of freezing and thawing increase the cost

of the process considerably, and can cause problems with labeling and secondary packaging.

It is also known to provide frozen or chilled precooked rice products. Such rice products are not shelf stable, but are sold in chill cabinets or freezer packaging formats. This kind of precooked rice product has an attractive, particulate rice grain structure, can be free flowing and easy to reheat. Unfortunately, such conventional chilled or frozen precooked rice products are not shelf stable. On the contrary, such products undergo spoilage upon storage at 25°C within a few days.

Accordingly, it is an object of the present invention to produce a shelf stable precooked cereal product that can readily be used to produce an attractive free-flowing, particulate cooked cereal. It is another object of the present invention to produce a shelf stable precooked rice product that can readily be used to produce an attractive free-flowing, particulate cooked rice.

The present invention provides a microwaveable pouch containing a shelf stable precooked cereal product. Preferably, the cereal product is selected from the group consisting of rice, couscous, wild rice, barley, wheat, oats, rye, millet and maize; most preferably, the cereal is rice. Preferably, the cereal product is in the form of grains.

It has been found, surprisingly, that microwaving a precooked shelf stable rice product or wild rice product inside a microwaveable pouch results in a free flowing, particulate cooked rice product or wild rice product having an attractive appearance and separate grains that can be poured from the pouch. Microwave heating seems to be much more effective, as well as faster than conventional heating methods, in reversing the agglomeration of precooked rice and wild rice.

The pouches according to the present invention are microwaveable. That is to say, they can be heated in conventional fashion in a microwave oven without

melting or scorching. In particular, the pouches are substantially free of any metallisation or other electrically conductive portions.

Preferably, the pouch comprises one or more polymer sheet materials, more preferably the pouch consists essentially of polymer sheet materials and the shelf stable precooked cereal product. Preferably, the sheet material is bonded by adhesive, ultrasound or heat sealing along at least one edge in the formation of the pouch. The sheet materials, should, of course, be food acceptable.

The polymer sheet materials should be substantially microorganism-impermeable in order to provide the desired shelf stability. For the same reason, the polymer sheet materials should have an oxygen permeability less than 10 $cm^3/m^2/24hr$, more preferably less than 1 $cm^3/m^2/24hr$ as measured by standard methods. Preferably, the sheet materials are substantially oxygen-impermeable.

Preferably, the sheet materials are thermoplastic, but do not soften greatly or melt at temperatures up to 125 °C in order to allow for heat stabilisation of the pouches by retorting or the like.

Preferably, the sheet material is substantially impermeable to water vapour. Preferably, the sheet material is a laminate of more than one polymer composition in order to achieve the desired combination of properties.

The microwaveable pouch according to the present invention may, for example, be manufactured on a conventional form-fill-seal machine or from pouches that are made in a separate operation. The pouches according to the present invention preferably contain from 0.1 to 1.0 kg of cereal product.

Preferably, the precooked cereal product comprises at least 40% by weight of water, more preferably at least 50% by weight, and most preferably from 60% to 80% by weight of water. The precooked cereal product may comprise other optional ingredients such as edible oil, preferably in an amount of from 1 to 5% by weight, salt preferably in an amount of from 0.5 to 2% by weight, flavouring agents

such as herbs, diced, shredded, chopped or sliced vegetables, fruits such as tomato, meat, meat products such as pepperoni strips, seafood, vegetable protein products such as tofu or mycoprotein, and mixtures thereof. Preferably, the cereal will have been precooked and rendered shelf stable by retorting a mixture of dry cereal and water in the pouch, in which case the precooked cereal product will frequently be an agglomerated (i.e. not free flowing) mass in the pouch. This is particularly the case after the precooked cereal has been stored in the pouch for a few days, e.g. seven days.

The precooked cereal product in the microwaveable pouch is shelf stable. That is to say, it can be stored at ambient temperatures such as 25°C for at least one month without unacceptable spoilage, i.e. without spoilage that would give rise to noticeable organoleptic deterioration or levels of microorganism contamination falling outside regulatory limits. More preferably, the cereal product packaged within the microwaveable pouch is shelf stable for at least three months at 25°C, and most preferably the microwaveable pouch is shelf stable for at least twelve months at 25°C.

The present invention further provides a method of preparing a free flowing cooked cereal product, wherein the method comprises: providing a microwaveable pouch in accordance with the present invention, followed by heating the pouch with microwave radiation to heat the cereal in the pouch.

Surprisingly, it was found that microwave heating of an agglomerated mass of precooked rice or wild rice in the pouch results in a particulate, free flowing hot cooked rice product or wild rice product that is superior to products obtained by conventional reheating methods, such as steaming or boiling.

The pouch is preferably pierced to relieve pressure before microwaving. Preferably, the step of heating is carried out at a power of 500 to 2000 Watts on a typical 250g pouch. Preferably, the step of heating is carried out for a time of from 0.5 to 10 minutes, preferably 1 to 5 minutes.

Preferably, the precooked cereal product is heated to a final temperature above the de-retrogradation temperature of the cereal starch, more preferably above the gelatinisation temperature of cereal starch. More preferably, the precooked cereal product is heated to a temperature of at least 80°C, preferably at least 90°C, more preferably at least 95°C in the heating step.

The present invention further provides a method of manufacture of a microwaveable pouch according to the invention, wherein the method comprises the steps, in order, of: providing an unfilled pouch of microwaveable material having an opening; inserting cereal, water and optionally other ingredients into the pouch through the opening; sealing the pouch; and heating the pouch at a temperature for a time sufficient to render the contents of the pouch shelf stable.

Preferably, the cereal filled into the pouch has a moisture content of 20% by weight or less, more preferably from 12 to 15% by weight. This cereal may be dry, raw or parboiled. The cereal is filled into the pouch with a predetermined quantity of water sufficient to achieve hydration of the cereal to the desired extent on cooking. In this way, the step of heat stabilisation or heat sterilisation of the cereal can be combined with the step of cooking the cereal.

The optional other ingredients filled into the pouch are selected from the group consisting of salt, oil, herbs, diced, shredded, chopped or sliced vegetables, fruits such as tomato, meat, meat products such as pepperoni strips, seafood, vegetable protein products such as tofu or mycoprotein, and mixtures thereof, as hereinbefore described.

Preferably, the step of heat sterilising comprises heating the pouch to least 115°C for at least 10 minutes, and more preferably from 118 to 125°C for 5 to 15 minutes. Preferably, the step of heat stabilising achieves a stabilisation level of at least Fo_4, preferably at least Fo_6 .

Specific embodiments of the present invention will now be described further, by way of example, with reference to the accompanying drawing, which

shows a plan view of a microwaveable shelf stable precooked cereal pouch according to the present invention.

Example 1

Referring to Figure 1, the microwaveable pouch 1 according to the present invention comprises front 2 and back (not shown) panels of a laminated polymeric sheet material. The sheet material has oxygen permeability less than $1cm^3/m^2/24$hours, excellent moisture barrier and microorganism barrier properties, high clarity and ease of handling. The polymeric sheet material is retort stable to 121°C. The laminate comprises an inner layer of cast polypropylene, a first layer of adhesive, a layer of polyamide, a second layer of adhesive, an oxygen barrier layer, and outer high gloss polyester layer. Other laminate structures fulfilling the requirements for a shelf stable microwaveable pouch material will be readily apparent to persons skilled in the relevant art.

The front 2 and back panels of the pouch 1 are tightly heat sealed together around their edges 3. The heat seal 4 at the bottom of the pouch is profiled to provide a rounded bottom 5 to the inside of the pouch. The pouch is coloured and printed over most of its area, but a window 6 is provided in the front panel 1 of the pouch to permit inspection of the rice contents. Nips 7 are provided near the top of the pouch to assist opening of the pouch by tearing or cutting.

In the present example, the pouch 1 is filled with 250g total weight of rice and other ingredients according to the following recipes.

1. Long Grain Rice

Parboiled Long Grain Rice	35-40%
Water	60-65%
Vegetable Oil	0.0-1.5%

2. Oriental Rice

Parboiled Long Grain Rice	30-40%
Diced Onion	5%
Sesame Oil	0.3%
Vegetable Oil	0.5-1.0%
Chives	0.3%
Soy Sauce	0.2%
Flavourings	1.6%
Pepper	0.04%
Salt	0.8%
Red Pepper Flake	0.4%
Sugar	0.4%
Water	50-60%

3. Basmati

Basmati Rice (Partially Hydrated)*	80-85%
Water	10-15%
Salt	0.2%
Citric Acid	0.1%
Basmati Flavouring	0.1%
Sunflower Oil	1-1.5%

* Basmatic rice cooked, cooled and drained to pick up between 60-80% of its weight of water.

4. Biryani Rice

Long Grain Rice	25-30%
Water	35-40%
Chicken Breast (Small Dice)	11.0%
Salt	1.0%
Vegetable Oil	1.5%
Butter	1.0%
Minced Garlic	0.8%
Chopped Ginger	0.5%
Diced Onion	2.0%
Diced Green Pepper	3.5%
Diced Red Pepper	3.5%
Curry Powder	1%
Coriander Leaves	0.7%
Spices	0.3%
Cumin Seeds	0.2%
Chicken Bouillon	0.7%
Flavourings	0.5%

The pouch is heat sealed across the top after filling to provide complete hermetic sealing of the ingredients inside the pouch. The pouch is then heat sterilised by retorting at 118 to 125°C for 5 to 15 minutes in an autoclave. This treatment both sterilises and cooks the contents of the pouch. The resulting pouch and its contents are shelf stable for at least 12 months.

When it is desired to consume the rice inside the pouch, it is merely necessary for the user to pierce the pouch to relieve excess pressure, and then microwave the pouch in a conventional domestic microwave oven for 1.5 to 3.0 minutes at 650 Watts to obtain a free flowing, particulate, hot rice product.

The above embodiments have been described by way of example only. Many other embodiments of the invention falling within the scope of the accompanying claims will be apparent to the skilled reader.

CLAIMS

1. A microwaveable pouch containing a shelf stable precooked cereal product.

2. A microwaveable pouch according to claim 1, wherein the cereal product is selected from the group consisting of rice, couscous, wild rice, barley, wheat, oats, rye, millet and maize.

3. A microwaveable pouch according to claim 2, wherein the cereal product is rice.

4. A microwaveable pouch according to claim 1, 2 or 3, wherein the pouch comprises a polymeric sheet material.

5. A microwaveable pouch according to claim 4, wherein the polymeric sheet material is a laminate of more than one polymeric composition.

6. A microwaveable pouch according to claim 4 or 5, wherein the polymeric sheet material has an oxygen gas permeability of less than 10 $cm^3/m^2/24hours$, preferably less than 1 $cm^3/m^2/24hours$.

7. A microwaveable pouch according to claim 4, 5 or 6, wherein the polymeric sheet material is heat sealed along at least one edge to form the pouch.

8. A microwaveable pouch according to any one of claims 4 to 7, wherein the polymeric sheet material is heat stable to at least 120°C.

9. A microwaveable pouch according to any one of claims 4 to 8, wherein the pouch consists essentially of said polymeric sheet material and said precooked cereal product.

10. A microwaveable pouch according to any preceding claim, wherein said precooked cereal product comprises at least 40% w/w of water, preferably at least 50 % w/w of water, and more preferably 60 to 80% w/w of water.

11. A microwaveable pouch according to any preceding claim, wherein said precooked cereal product is agglomerated.

12. A microwaveable pouch according to any preceding claim, wherein said precooked cereal product is shelf stable for at least 3 months at 25°C.

13. A method of preparing a free flowing cooked cereal product, said method comprising:

providing a microwaveable pouch according to any one of claims 1 to 12; and

heating said cereal in said pouch with microwave radiation.

14. A method according to claim 13, wherein said step of heating is carried out for a time of from 0.5 to 10 minutes, preferably 1 to 5 minutes.

15. A method according to claim 13 or 14, wherein said precooked cereal product is heated to a final temperature of at least 80°C, preferably at least 90°C in said heating step.

16. A method of manufacture of a microwaveable pouch according to any one of claims 1 to 12, comprising the steps, in order, of:

providing an unfilled pouch of microwaveable material;

inserting cereal, water, and optionally other ingredients into the pouch;

sealing the pouch; and

heating the pouch at a temperature and for a time sufficient to render the contents of the pouch shelf stable.

17. A method according to claim 16, wherein said cereal filled into said pouch has a moisture content of 20% w/w or less.

18. A method according to claim 16 or 17, wherein said optional other ingredients are selected from the group consisting of salt, oil, flavouring agents, vegetables, fruits, meat, meat products, seafood, vegetable protein products, and mixtures thereof.

19. A method according to any one of claims 16 to 18, wherein said step of heat sterilising comprises heating the pouch to at least 115°C.

20. A method according to any one of claims 16 to 19, wherein said step of heat sterilising comprises heating the pouch to a temperature of 118°C to 125°C for a time of 5 to 15 minutes.

21. A microwaveable pouch substantially as hereinbefore described with reference to the Examples.

22. A method of manufacture of a microwaveable pouch substantially as hereinbefore described with reference to the Examples.

23. A method of preparing a free flowing cooked rice product substantially as hereinbefore described with reference to the Examples.

Application No: GB 9918307.1 **Examiner:** Stephen Smith
Claims searched: 1-23 **Date of search:** 21 December 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): A2B(BMR1, BMR5); B8C(CWA1)

Int Cl (Ed.6): A23L 1/182; B65D 81/34

Other: ONLINE:EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP 0728678 A2	(MITSUBISHI) lines 29-41 of page 4; lines 16-51 of page 5	1-7, 9, 13, 14, 16, 18
X	JP 11094260	(KURARAY) abstract	1-3, 13, 16, 18
X	JP 11028063	(KISHIMOTO) abstract	1-3, 10, 13, 16
X	JP 10167344	(SHOWA) abstract	1-3, 13

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.